REMARKS

This Response is offered in reply to Office Action mailed June 18, 2003.

In paragraph 3 of the action, claims 10-15 and 21-24 are rejected under 35 USC 103(a) in view of the WO '973 document taken with the Nazmy '442 patent.

The examiner acknowledges that the WO '973 document does not teach the use of a titanium aluminide alloy including a rare earth element in an amount effective to prolong resistance to attack of the alloy by molten metallic material comprising aluminum. The examiner argues that the '442 patent teaches certain alloying additions, such as yttrium, to titanium aluminide to provide excellent hardness and strength at high temperatures, enabling the field of application of the resulting alloyed titanium aluminide alloys to be extended to temperatures between 600-1000 degrees C. The examiner refers to exemplary embodiments 54 and 56 and alloys 14, 15, 21, and 23 of the '442 patent as illustrating that the field of application of the modified Ti-Al alloys of the '442 patent can be extended to temperatures between 600 to 1000 degrees C. The examiner argues that it would have been obvious to add yttrium of the '442 patent to the WO' 973 document.

Applicants disagree with the rejection. Firstly, Applicants are claiming in claims 10-15 a method of increasing the service life of a titanium aluminide alloy in contact with a molten metallic material comprising aluminum beyond the life provided by WO' 973 itself and not an alloy per se. Claims 21-24 are similar with respect to prolonging the resistance to attack of one or more of die casting die, shot sleeve, and plunger.

The examiner acknowledges that the WO' 973 document does not disclose or suggest Applicants' claimed methods.

The '442 patent by the examiner's own admission discloses only certain alloying additions to titanium aluminide to provide excellent hardness and strength at high temperatures. Neither cited reference discloses or suggests Applicants' claimed methods of claims 10-15 and 21-24.

Secondly, the examiner surely will appreciate that determination of mechanical properties, such as hardness and tensile strength, in an air environment in the '442 patent teaches absolutely nothing about the resistance of the titanium alloys to attack by contact with a molten metallic material comprising aluminum. The examiner should note that nowhere in the WO '973 document or the '442 patent is there any disclosure or suggestion of a method of increasing the service life of a titanium aluminide alloy in contact with a molten metallic material comprising aluminum by including in the titanium aluminide alloy a rare earth element in an effective amount to prolong resistance to attack of the alloy by the molten metallic material. The examiner cannot use mechanical property test data determined for titanium aluminide alloys in air to extrapolate or predict the effect of an alloying element, such as a rare earth element, on resistance of the alloy to attack by molten metallic material comprising aluminum. To do so would amount to mere speculation on the examiner's part. Applicants ask the examiner to cite any teaching in the '442 patent that would lead one skilled in the art to arrive at Applicants' claimed method for increasing the service life of a titanium aluminide alloy in contact with a molten metallic material comprising aluminium.

Thirdly, Applicants refer the examiner to page 4 of the specification where the resistance of different specimens to attack by molten aluminum at 700 degrees C is described and shown in the TABLE. The TABLE reveals that resistance to attack was increased by more than 2 times for the titanium aluminide

alloy including 1.5 weight % Y pursuant to the invention as compared to the titanium alloy without Y (i.e. 0 weight % Y) representative of WO '973. The TABLE also reveals that resistance to attack was increased by more than 4 times for the titanium aluminide alloy including 5.0 weight % Y pursuant to the invention as compared to the titanium alloy without Y (i.e. 0 weight % Y) representative of the WO '973 document. Neither the WO '973 document nor the '442 patent provides any disclosure or suggestion whatsoever that resistance to such attack can be so dramatically prolonged by including a rare earth element in a titanium aluminide alloy. Applicants' ask the examiner to identify where in either cited reference is such an improvement even remotely suggested.

Fourthly, Applicants disagree with the proposed combination of the '442 patent with the WO '973 document to reject Applicants' claims 10-15 and 21-24. As pointed out above, the WO '973 document makes no disclosure or suggestion to include a rare earth element for any purpose. The '442 patent discloses only an improvement in hardness and strength achieved in testing that presumably is conducted in ambient air by inclusion of numerous alloying elements. As mentioned above, the examiner cannot use mechanical property test data determined for titanium aluminide alloys in air to extrapolate or predict the effect of an alloying element, such as a rare earth element, on resistance of the alloy to attack by molten metallic material comprising aluminum. To do so would amount to mere speculation on the examiner's part. Applicants ask the examiner to cite any teaching in the '442 patent that would lead one skilled in the art to arrive at Applicants' claimed method for increasing the service life of a titanium aluminide alloy in contact with a molten metallic material comprising aluminium.

Fifthly, the examiner can arrive at Applicants' method claims 10-15 and 21-24 only through a prohibited hindsight analysis after having knowledge of the claimed invention. The examiner admits that the WO '973 document is silent to this end. The examiner should appreciate that the '442 patent's disclosing to add Y or other element to a Ti-Al alloy to improve hardness and strength at high temperature in air teaches nothing with respect to Applicant's method claims directed to increasing the service life of the titanium aluminide alloy by prolonging resistance to attack by molten metallic material comprising aluminum and its alloys. The hindsight nature of the rejection is evident in the examiner's choosing only Y as the alloying element from the WO '973 document out of the numerous alloying elements listed in the '442 patent. For example, the '442 patent lists Co, Cr, Ge, Hf, Mn, Mo, Nb, Pd, Ta, V, W, Y, and/or Zr as alloying elements to improve hardness and strength in air testing. The examiner picks only the Y alloying element from among those listed to reject claims 10-15 and 21-24 without any teaching in the '442 patent that Y or any of the other numerous alloying elements listed would have an effect of any kind on the alloy with respect to attack by a molten metallic material comprising aluminum.

The cited references taken alone or together do not render obvious Applicants' claims 10-15 and 21-24. Reconsideration of the Section 103 rejection of claims 10-15 and 21-24 is requested.

In paragraph 4 of the action, claims 16-20 are rejected under 35 USC 103(a) in view of the WO '973 document taken with the Nazmy '442 patent and the additional Choudbury '212 patent.

The gross deficiencies of the WO' 973 document and the '442 patent are discussed above. The examiner acknowledges that WO' 973 does not disclose reheating a titanium aluminide alloy to

form a surface oxide or cleaning the alloy to remove molten metallic material.

The examiner mistakenly relies on the '212 patent to make up for these gross deficiencies. The examiner is believed to have misconstrued the '212 patent since the '212 patent expressly discloses casting of the Ti-containing materials identified in the table at column 1, lines 20-25 including titanium aluminide. At column 4, lines 21-23, the mold parts 2, 3 are expressly described as being made of heat-resistant steel and not titanium aluminide alloy as set forth in claims 16-20. The '212 patent merely discloses to periodically inspect and clean the heat-resistant steel mold parts 2, 3. There is no disclosure in the '212 patent of the combination of steps of claim 16 of removing a titanium alloy from contact with molten metallic material comprising aluminum, cleaning the titanium aluminide alloy to remove the molten metallic material thereon, heating the titanium aluminide alloy in an oxygen-bearing atmosphere at elevated superambient temperature to form a surface oxide thereon, and re-contacting the titanium aluminide alloy having the surface film thereon with the molten metallic material. The '212 patent is utterly silent with respect to provision of a rare earth element in a titanium aluminide alloy as set forth in claims 18-20.

Reconsideration of the Section 103 rejections of claims 16-20 is requested.

In paragraph 6 of the office action, claims 10-15 and 21-24 are rejected under the judicially created doctrine of obviousness type double patenting in view of claims 1-14 of US Patent 6 238 195 in view of the '442 patent.

The examiner acknowledges that the '195 patent does not teach the use of a titanium aluminide alloy including a rare earth element in an amount effective to prolong resistance to

attack of the alloy by molten metallic material comprising aluminum.

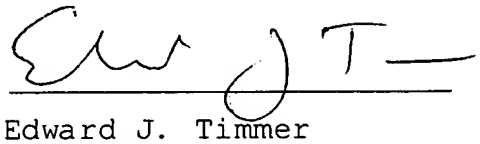
The examiner's citation of the '442 patent to make up for this gross deficiency of the '195 patent is in error for the reasons set forth above. The 442 patent discloses only an improvement in hardness and strength achieved in ambient air testing. The '442 patent nowhere discloses contacting a Ti-Al alloy with molten metallic material comprising aluminum and nowhere discloses or suggests a method of increasing service life of an alloy in contact with such molten metallic material. The examiner should now appreciate that mechanical properties in ambient air in the '442 patent teach absolutely nothing about the resistance of alloys to attack by contact with a molten metallic material comprising aluminum. The examiner cannot use mechanical property test data determined for titanium aluminide alloys in air to extrapolate or predict the effect of an alloying element, such as a rare earth element, on resistance of the alloy to attack by such molten metallic material. To do so would amount to mere speculation on the examiner's part.

Applicants again refer to the Table on page 4 of their specification and its showing of a dramatic prolongation of the resistance of the tested titanium aluminide alloys to attack by molten aluminum. Such dramatic prolongation of resistance to attack is not disclosed or remotely suggested by either the '195 patent or the '442 patent. Applicants' again ask the examiner to identify where in either cited reference is such an improvement even remotely suggested.

Reconsideration of the obviousness type double patenting rejection is requested.

Allowance of pending claims 10-24 is requested.

Respectfully submitted,



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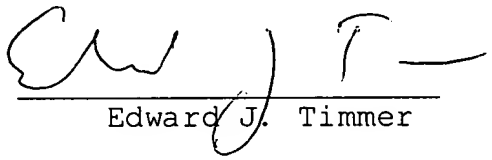

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